

Clinical Assessment of Nutritional Status

Physical signs and symptoms of malnutrition can be valuable aids in detecting nutritional deficiencies. These may include delayed growth and development as determined by comparing an individual or a group with normal values on growth charts; pallor of the skin, mucous membranes of the mouth and eyes, nail beds or palm surfaces; and the more serious signs of advanced protein-calorie malnutrition such as changes occurring in hair color and body appearance, as by edema. Obviously, the sooner the diagnosis of nutritional status is made in individuals and in populations the sooner clinical public health intervention programs can be formulated.

One does not have to be a physician to recognize major signs of nutritional deprivation. Auxiliary health workers can be trained in nutritional diagnosis so that they may be alerted to the major signs of clinical deficiencies. They, in turn, can alert physicians who may then conduct a more detailed examination so that the presence or absence of nutritional deficiencies can be more definitively ascertained. In 1962 the World Health Organization Expert Committee on Medical Assessment of Nutritional Status proposed a classification of physical signs to be used in nutrition surveys. Updated in 1966, this is a most valuable guide* in the diagnosis and interpretation of the clinical signs of malnutrition.

It must be emphasized that 1) signs of malnutrition may not be specific—that is, they may be related to non-nutritional factors such as poor hygiene or excessive exposure to the sun—and 2) they may not correlate with dietary intake data or the biochemical values in the individual or the population. This should not discourage the health worker from participating in the clinical evaluation of children and adults.

The W.H.O. Committee has conveniently classified the physical signs most often associated with malnutrition into the following three groups:

Group One—Signs that are considered to be of value in nutritional assessment. These are often associated with nutritional deficiency status. Signs of malnutrition may often be mixed and may be due to the de-

ficiency of two or more micronutrients.

Group Two—Signs that need further investigation. They may be related to malnutrition, perhaps of a chronic type, but are often found in populations of developing countries where other health and environmental problems, such as poverty and illiteracy, are co-existent.

Group Three—These include physical signs that have no relation to malnutrition, although they may be similar to physical signs found in persons with malnutrition and must be carefully delineated from them. This usually takes the particular expertise of a physician or other health worker expertly trained in nutritional diagnosis.

Table 1 has been adapted from the W.H.O. Expert Committee on Medical Assessment of Nutritional Status, and further reported in the volume "The Assessment of Nutritional Status of the Community" (see Selected References).

Although it is important to recognize that various signs have different degrees of reliability, signs of malnutrition falling in Groups One and Two have been combined in Table 1 and are described in less technical terminology so that health workers of all categories may better understand their clinical significance. The W.H.O. classification is particularly helpful when the survey is limited in scope and aimed at rapid clinical screening of the community, or consists of a research project possibly including an evaluation of less certain signs (Group Two). The more reliable the signs, and the more experienced the observer, the more definitive the nutritional diagnosis is likely to be. A comprehensive list of signs is found in Appendix A. A definition of physical signs and nutritional terms associated with malnutrition will be found in Appendix B.

Physical signs should be recorded as precisely and practicably as possible. There are, in fact, signs that are associated with malnutrition which may be explained by future knowledge. These include skin discolorations, inflammation of the eyelids, and other signs. An important consideration in interpreting physical signs is the need

* W.H.O. Monograph No. 53. (See Selected References)

Table 1—Physical Signs Indicative or Suggestive of Malnutrition

Body Area	Normal Appearance	Signs Associated with Malnutrition
Hair	Shiny; firm; not easily plucked	Lack of natural shine; hair dull and dry; thin and sparse; hair fine, silky and straight; color changes (flag sign); can be easily plucked
Face	Skin color uniform; smooth, pink, healthy appearance; not swollen	Skin color loss (depigmentation); skin dark over cheeks and under eyes (malar and supra-orbital pigmentation); lumpiness or flakiness of skin of nose and mouth; swollen face; enlarged parotid glands; scaling of skin around nostrils (nasolabial seborrhea)
Eyes	Bright, clear, shiny; no sores at corners of eyelids; membranes a healthy pink and are moist. No prominent blood vessels or mound of tissue or sclera	Eye membranes are pale (pale conjunctivae); redness of membranes (conjunctival injection); Bitot's spots; redness and fissuring of eyelid corners (angular palpebritis); dryness of eye membranes (conjunctival xerosis); cornea has dull appearance (corneal xerosis); cornea is soft (keratomalacia); scar on cornea; ring of fine blood vessels around corner (circumcorneal injection)
Lips	Smooth, not chapped or swollen	Redness and swelling of mouth or lips (cheilosis); especially at corners of mouth (angular fissures and scars)
Tongue	Deep red in appearance; not swollen or smooth	Swelling; scarlet and raw tongue; magenta (purplish color) of tongue; smooth tongue; swollen sores; hyperemic and hypertrophic papillae; and atrophic papillae
Teeth	No cavities; no pain; bright	May be missing or erupting abnormally; gray or black spots (fluorosis); cavities (caries)
Gums	Healthy; red; do not bleed; not swollen	"Spongy" and bleed easily; recession of gums
Glands	Face not swollen	Thyroid enlargement (front of neck); parotid enlargement (cheeks become swollen)
Skin	No signs of rashes, swellings, dark or light spots	Dryness of skin (xerosis); sandpaper feel of skin (follicular hyperkeratosis); flakiness of skin; skin swollen and dark; red swollen pigmentation of exposed areas (pellagrous dermatosis); excessive lightness or darkness of skin (dyspigmentation); black and blue marks due to skin bleeding (petechiae); lack of fat under skin
Nails	Firm, pink	Nails are spoon-shape (koilonychia); brittle, ridged nails
Muscular and skeletal systems	Good muscle tone; some fat under skin; can walk or run without pain	Muscles have "wasted" appearance; baby's skull bones are thin and soft (craniotabes); round swelling of front and side of head (frontal and parietal bossing); swelling of ends of bones (epiphyseal enlargement); small bumps on both sides of chest wall (on ribs)—beading of ribs; baby's soft spot on head does not harden at proper time (persistently open anterior fontanelle); knock-knees or bow-legs; bleeding into muscle (musculo-skeletal hemorrhages); person cannot get up or walk properly
Internal Systems:		
Cardiovascular	Normal heart rate and rhythm; no murmurs or abnormal rhythms; normal blood pressure for age	Rapid heart rate (above 100 tachycardia); enlarged heart; abnormal rhythm; elevated blood pressure
Gastrointestinal	No palpable organs or masses (in children, however, liver edge may be palpable)	Liver enlargement; enlargement of spleen (usually indicates other associated diseases)
Nervous	Psychological stability; normal reflexes	Mental irritability and confusion; burning and tingling of hands and feet (paresthesia); loss of position and vibratory sense; weakness and tenderness of muscles (may result in inability to walk); decrease and loss of ankle and knee reflexes

to standardize the definition of a particular sign before a survey or other health evaluation is launched. Thus, a nutrition survey team is often given substantial orientation sessions by physicians with formal experience in the identification and interpretation of the physical signs of malnutrition. Other factors of importance are:

1. The avoidance of such terms as "poor", "fair", or "good", in terms of nutritional status

unless criteria for these terms are properly identified.

2. Considering the use of an easily available and standardized skinfold caliper, which is coming into greater use by health personnel, to determine thickness of subcutaneous fat (such as the Lange® skinfold caliper.*)

* Cambridge Scientific Instruments, Inc., Cambridge, Md.

Color slides** are available to assist health personnel in identification and standardization of signs of physical deficiencies.

Few signs of nutritional deficiency are specifically due to the lack of a particular nutrient. Iodine deficiency is associated with thyroid enlargement, and severe paleness of the skin is associated with anemia. However, the anemia may be due to blood loss due to non-nutritional diseases; and, though unlikely on a probability basis, the thyroid enlargement may be due to a cancer.

As emphasized previously, the signs of malnutrition are multiple. The finding of one sign will at least nudge the observer to go to a more careful assessment of the body for other signs. Environmental factors (such as excessive heat or sun, wind or cold air), lack of general personal hygiene, and cultural factors can cause or contribute to the physical signs which are also associated with malnutrition.

The age of the person being examined also plays a role in the way the signs present themselves and in the interpretation of the signs. For example, signs of vitamin A deficiency in early childhood are different from those found in school age children. Scurvy, or vitamin C deficiency, often presents in the child as painful swollen joints, due to bleeding into the bones, whereas in elderly people, it appears as small "black and blue" marks which very often appear on the shinbones.

Any physical finding that suggests a nutritional abnormality should be considered a clue rather than a diagnosis and, as such, should be pursued further. For example, pallor should not be considered diagnostic of anemia but should be used as a clue to obtain the laboratory confirmation for anemia. Similarly, epiphyseal enlargement or costochondral beading should not be interpreted as evidence of rickets without x-ray confirmation, and enlargement of the thyroid gland should only be interpreted as evidence of iodine deficiency after appropriate laboratory confirmation.

The detailed clinical examination for signs of malnutrition must also include a search for signs related to metabolic diseases which have nutritional relationships. Notable among these are diabetes and the hyperlipidemias. Table 2 summarizes the physical findings of hyperlipidemia which are indicative of high levels of serum cholesterol and/or triglyceride in a nutritional assessment study.

Finally, it must be recognized that the use of clinical methods in detecting nutritional deficiencies has definite disadvantages when interpreted alone. Used in a cautious manner in connection with dietary and biochemical methods,

Table 2—Physical Signs and Laboratory Evidence of Hyperlipidemia

Small, yellowish lumps around eyes (xanthelasma)
Small or large tumors around joints of hands, legs, or skin (xanthomas)
White ring around both eyes (corneal arcus)
Early coronary heart disease
Enlargement of liver and spleen
Turbid or creamy appearance of serum
High serum levels of cholesterol and/or triglycerides
Abnormal blood lipoprotein patterns

they may greatly assist in providing a picture of the nutritional status of individuals or of the community. It is anticipated that, as biochemical procedures become more refined and nutrition surveys are accomplished with more standardized formats, our increased knowledge will enable us to make more precise nutritional diagnoses.

The major problems encountered in the clinical assessment of nutritional status are:

1. Their low general prevalence in developed countries except in high risk groups;
2. The non-specificity of clinical signs in most populations, particularly developed countries; and
3. The substantial differences in the prevalence of physical signs recorded by different examiners.

However, physical examinations should be an integral part of most nutrition surveys for the following reasons:

- A physical examination may reveal evidence of certain nutritional deficiencies which will not be detected by dietary or laboratory methods.
- The identification of even a few cases of clear-cut nutritional deficiency may be particularly revealing and provide a clue to other pockets of malnutrition in a community.
- The nutritional examination may reveal signs of a host of other diseases which merit diagnosis and treatment. Generally, these will be referred to the patient's physician or to other health facilities.

Physical signs vary from population to population. For example, in one study, underweight Jamaican children displayed dental caries and xerosis (dryness of eye membranes), while normal weight children in Jamaica and even underweight children examined in Barbados rarely showed these signs.

Physical signs may also vary over time periods which may witness rapid changes in the nutritional and social environment. Thus, angular stomatitis (fissuring at the side of the lips) was found in Jamaican children by a team of nutrition-

** *How to Diagnose Nutritional Practices in Daily Practice*, No. 5. *Nutrition Today*, 1140 Connecticut Ave., NW, Wash., D.C. 20036.

ists on one occasion, but not detected until three years later by another group of investigators. Moreover, the physical signs of protein-calorie malnutrition display one constellation in the Caribbean and another in the Far East.

Several studies have revealed the inability to relate clinical signs suggestive of nutritional deficiency and other evidence of malnutrition in patients attending New York City nutrition clinics, Indian village children, and in the recently published Ten State Nutrition Survey.

Several authors have offered a grouping of clinical signs of malnutrition that may be found useful. A child having one or more of the following signs may be classified as suffering from protein-calorie malnutrition: edema, dyspigmentation of the hair, easy pluckability of the hair, thin sparse hair, muscle wasting, moonface, flaky-paint rash, and dermatosis.

With regard to vitamin deficiency, the following signs are of value: xerosis of the conjunctivae. Bitot's spots and corneal xerosis are considered signs of vitamin A deficiency, whereas angular stomatitis, cheilosis, glossitis and atrophic or hypertrophic lingual papillae are signs of deficiency of the B-complex vitamins.

A rather good correlation has been documented among children in India between the ages of one to five years between weight, height-weight index, calf circumference, and the clinical signs of protein-calorie malnutrition. On the other hand, such anthropometric measures did not identify children with vitamin deficiencies. Similarly, a relationship among children in southern Iran between body weight and malnutrition has also been reported. Growth retardation was associated with lower hemoglobin, serum protein, and serum albumin levels.

Examination of the thyroid gland is an important part of the nutritional examination. The following grading system has been recommended by W.H.O. nutritionists: with normal being one lobe the size of the first phalanx of the subject's thumb; grade 1 is one lobe greater than the size of the first phalanx of the subject's thumb; grade 2, a gland that is visible with the neck extended; grade 3, a gland that is visible with the neck in the normal position; and grade 4, a gland that is visible from a considerable distance, such as from across the room.

To illustrate inter-observer variability, Table 3 indicates the percentage of agreement between two examiners on selected physical signs during a nutrition survey in a developing country.

Table 4 compares the recording of three examiners working in an area included during the Ten State Nutrition Survey. No way has yet been found to eliminate such biases on the part of

examiners although it can be presumably reduced by prior agreement and comparisons during a survey.

Table 3—Percent Positive Agreement of Physical Signs in 895 Duplicate Examinations *

Angular lesions	75
Goiter	63
Filiform papillary atrophy	50
Follicular hyperkeratosis	50
Abnormal hair	36
Swollen red gums	33
Glossitis	0

* Source: Hansen, R. G., and Monroe, H. N. (eds.) *Problems of assessment and alleviation of malnutrition in the United States*. Proceedings of a workshop sponsored by Vanderbilt University, January 13-14, 1970.

Table 4—Percentage of Adult Clinical Findings by Three Examiners in a Selected Area of the Ten State Nutrition Survey *

	Examiners		
	1	2	3
Number of examinations	1,123	1,127	589
Filiform papillary atrophy	4.1	1.1	11.2
Follicular hyperkeratosis	4.0	0.6	6.8
Swollen red gums	2.8	3.7	4.1
Angular lesions	0.4	0.4	1.2
Glossitis	0.6	0.4	0.5
Goiter	3.6	6.6	3.6

* Source: Hansen, R. G., and Monroe, H. N. (eds.) *Problems of assessment and alleviation of malnutrition in the United States*. Proceedings of a workshop sponsored by Vanderbilt University, January 13-14, 1970.

Anthropometric Methods

At the 1968 White House Conference on Food, Nutrition and Health, the following recommendations on anthropometric methods of clinical evaluation were made:

Neonates and Infants

Weight
Recumbent length (crown-heel)
Head circumference
Chest circumference
Triceps skinfold

Pre-schoolers

The same as preceding category
Standing height replaces recumbent
Arm circumference

School Age Through Adolescence

Delete head and chest circumferences
Standing height
Otherwise the same as preceding categories

**Table 5—Smoothed Average Weights* for Men and Women
(by age and height: United States 1960-1962 **)**

Height (in inches)	Weight (in pounds)						
	18-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65-74 years	75-79 years
Men							
62 -----	137	141	149	148	148	144	133
63 -----	140	145	152	152	151	148	138
64 -----	144	150	156	156	155	151	143
65 -----	147	154	160	160	158	154	148
66 -----	151	159	164	164	162	158	154
67 -----	154	163	168	168	166	161	159
68 -----	158	168	171	173	169	165	164
69 -----	161	172	175	177	173	168	169
70 -----	165	177	179	181	176	171	174
71 -----	168	181	182	185	180	175	179
72 -----	172	186	186	189	184	178	184
73 -----	175	190	190	193	187	182	189
74 -----	179	194	194	197	191	185	194
Women							
57 -----	116	112	131	129	138	132	125
58 -----	118	116	134	132	141	135	129
59 -----	120	120	136	136	144	138	132
60 -----	122	124	138	140	149	142	136
61 -----	125	128	140	143	150	145	139
62 -----	127	132	143	147	152	149	143
63 -----	129	136	145	150	155	152	146
64 -----	131	140	147	154	158	156	150
65 -----	134	144	149	158	161	159	153
66 -----	136	148	152	161	164	163	157
67 -----	138	152	154	165	167	166	160
68 -----	140	156	156	168	170	170	164

* Estimated values from regression equations of weights for specified age groups.

** Adapted from Weight, Height, and Selected Body Dimensions of Adults, United States 1960-1962, Series 11, No. 8, National Center for Health Statistics, Washington, D.C.

Adulthood and Aging

Height, standing
Weight
Triceps skinfold
Subscapular skinfold
Arm circumference

These measurements can be accomplished with efficiency, speed, and accuracy by trained non-professional personnel. Measuring length and weight for gestational age and skinfold thickness in neonates is helpful in distinguishing intra-uterine growth retardation, small-for-date babies, dysmaturity, and post-maturity. The gathering of these anthropometric measurements on newborn infants would also help to identify target populations and groups in need of nutritional assistance.

Weight should be recorded, using a beam balance; spring balances are notoriously inaccurate for this purpose. Height should be measured without shoes. Either the Lange® or the Harpen-

den® calipers can be used to record triceps or subscapular skinfold thickness. The integration of triceps skinfold thickness and arm circumference can be used to calculate lean body mass (see Tables 5 and 6).

Height and weight of individuals over 60 years of age may not be accurate indices of body composition and nutritional status because of osteoporotic changes.

In gathering anthropometric measurements as part of a data collection system, standardized equipment and procedures should be used. Appropriate reference standards for height, weight, head circumference, chest circumference, arm circumference, triceps, and subscapular skinfolds, etc., must be selected based on the:

- Characteristics of the population being examined;
- Availability of data on that segment of the population presumed to have achieved "optimal growth";

- Recommendations of various nutrition agencies who have endeavored to standardize anthropometric data collection from different parts of the world.

Table 6—Obesity Standards for Caucasian Americans *

Age (years)	(minimum triceps skinfold thickness in millimeters indicating obesity)**	
	Male	Female
5	12	14
6	12	15
7	13	16
8	14	17
9	15	18
10	16	20
11	17	21
12	18	22
13	18	23
14	17	23
15	16	24
16	15	25
17	14	26
18	15	27
19	15	27
20	16	28
21	17	28
22	18	28
23	18	28
24	19	28
25	20	29
26	20	29
27	21	29
28	22	29
29	23	29
30-50	23	30

* Adapted from Seltzer, C. C. and Mayer, J. A simple criterion of obesity. *Postgrad. Med.* 38: A101-107, 1965.

** Figures represent the logarithmic means of the frequency distributions plus one standard deviation.

The Iowa and Boston growth curves (see Appendix A of the Section on Infants and Children) are currently in use as reference standards in the United States and abroad. In the near future, additional data on white and black children in the United States, ages 6-11 and 12-17, will be available from the National Center for Health Statistics. These data may provide a more suitable standard for use in these age groups.

Growth charts can be utilized by all levels of workers in health and nutritionally-related fields. Major events, such as illnesses, end of breast feeding, birth of a sibling, etc., should be recorded on the chart. Growth charts can be important tools in individual and community education for a wide variety of different groups, including policy makers, health workers, parents, and others.

It is evident that chronic undernutrition, or malnutrition of sufficient degree, will retard growth and development. It should also be clear that retardation in growth and development is not evidence of malnutrition per se, since many other environmental and genetic factors influence growth and development. Much could be learned of the interrelationships between host and environmental effects on growth and development, if an adequate system of nutrition and health data collection could be developed.

While the above measurements focus particularly on undernutrition, they will also detect obesity, which is a combined medical and nutritional problem.

In 1971, the International Union of Nutritional Sciences recommended that, in the evaluation of the nutritional status of a population, first priority be given to measurements in the age group from birth to four years of age, and second priority be given to those between seven and nine years of age.

Dental Examinations

A dental examination is usually included as part of the clinical assessment in most nutrition surveys. This is important in the development or evaluation of comprehensive health care programs. Although the dental examination may not contribute greatly to the evaluation of nutritional status, it may partially reflect fluoride intake and the general effect of diet upon the induction of dental caries. Severe dental problems, missing teeth, pyorrhea, etc., may influence the nature of the diet consumed and be partially responsible for nutritional inadequacies.

Every person surveyed should be screened for dental caries and the status of gingival hygiene. The dental findings recorded should include:

- Obvious dental caries;
- Periodontal disease as manifested by hyperemia, edema, ease of bleeding, or retraction;
- Calculus deposit;
- Soft materia alba.

The recording of the presence or absence of these findings, and some indication of the degree of severity, is indicated. It may not be necessary to quantitate these findings by calculating the DMF (decayed-missing-filled), PI (periodontal disease), and OHI (oral hygiene index) indices. These indices require standardization of the techniques and of the examiners. It has been pointed out that, as with medical nutritionists evaluating physical signs of malnutrition, even fully-trained dentists may have difficulty in recording these indices objectively, and inter-examiner variation is likely to be considerable.

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Appendix A

NATIONAL NUTRITION SURVEY GENERAL CLINICAL EXAMINATION (Adults and children 6 years of age and over)					Budget Bureau No. 68-S68029 Approval Expires June 30, 1970				
					A. Identification code State (1-2) County (3-5) E.D. (6-7) <div style="display: flex; justify-content: space-around;"> <div><input type="text"/></div> <div><input type="text"/></div> <div><input type="text"/></div> </div> Household No. (8-9) Family (10) Line No. (11-12) <div style="display: flex; justify-content: space-around;"> <div><input type="text"/></div> <div><input type="text"/></div> <div><input type="text"/></div> </div> Date of birth (14-19) Dietary (13) Month Day Year Sex (20) <div style="display: flex; justify-content: space-around;"> <div><input type="text"/></div> <div><input type="text"/></div> <div><input type="text"/></div> <div><input type="text"/></div> <div><input type="text"/></div> <div><input type="text"/></div> </div>				
					B. Name <input style="width: 100%;" type="text"/>				
					C. GENERAL EXAMINATION—Code: 0—Negative; 1—Positive, unless other positive codes are designated; 8—Not appl.				
Examination	Doubtful	Col. No.	Code	Examination	Doubtful	Col. No.	Code		
1. HAIR Neg. <input type="checkbox"/>		(21)		6. TONGUE a. Filiform papillary atrophy 1—Mild 2—Moderate 3—Severe		(39)			
2. EYES All Neg. <input type="checkbox"/>	a. Thickened opaque bulbar conjunctivae		(22)	All Neg. <input type="checkbox"/>	b. Fungiform papillary hypertrophy 1—Mild 2—Moderate 3—Severe		(40)		
	b. Angular lesions of eyelids		(23)		c. Geographic		(41)		
	c. Circumcorneal injection, bilateral		(24)		d. Fissures		(42)		
	d. Conjunctival injection, bilateral		(25)		e. Serrations or swellings		(43)		
	e. Xerosis conjunctivae		(26)		f. Red edges		(44)		
	f. Bitot's spots		(27)		g. Scarlet beefy (<i>Glossitis</i>)		(45)		
	g. Xerophthalmia		(28)		h. Magenta		(46)		
3. LIPS All Neg. <input type="checkbox"/>	a. 1—Angular lesions 2—Angular scars 3—Both		(29)	7. FACE AND NECK All Neg. <input type="checkbox"/>	a. Malar pigmentation		(47)		
	b. Cheilosis		(30)		b. Nasolabial seborrhea		(48)		
4. TEETH All Neg. <input type="checkbox"/>	a. 1—Edent. 3—Both 2—Plates 8—Has teeth		(31)		c. Parotids visibly enlarged		(49)		
	b. Visible caries, 4+		(32)		d. Thyroid enlarged 0, 1, 2, 3		(50)		
	c. 1—Debris 2—Calculus 3—Both		(33)	8. FINGERS AND NAILS Neg. <input type="checkbox"/>	1—Clubbed		(51)		
	d. Fluorosis		(34)		2—Spooned				
5. GUMS All Neg. <input type="checkbox"/>	a. Atrophy, recession, inflammation 1—Local 2—Diffuse		(35)	END CARD NUMBER 1 (78-80) 0 5 1					
	b. Marginal redness or swelling 1—Local 2—Diffuse		(36)	START CARD NO. 2 (Repeat Cols. 1-20 from card 1)					
	c. Swollen red papillae 1—Local 2—Diffuse		(37)	9. SKIN All Neg. <input type="checkbox"/>	a. Follicular hyperkeratosis, arms		(21)		
	d. Bleeding gums 1—Local 2—Diffuse		(38)		b. Follicular hyperkeratosis, back		(22)		
					c. Dry or scaling (<i>Xerosis</i>)		(23)		

NCCD-3-5 (D.C.) DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE—PUBLIC HEALTH SERVICE
 REV. 3-69 DIVISION OF CHRONIC DISEASE PROGRAMS—NUTRITION PROGRAM
 4040 NORTH FAIRFAX DRIVE, ARLINGTON, VIRGINIA 22203

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Appendix A (continued)

C. GENERAL EXAMINATION—Continued									
Examination		Doubt- ful	Col. No.	Code	Examination		Doubt- ful	Col. No.	Code
9. SKIN (Continued)	d. Hyperpigmentation face or hands		(24)		11. LOWER EXTREM- ITIES	a. Calf tenderness		(32)	
	e. Thickened pressure points, not elbow or knee		(25)			b. Pretibial edema, bilateral		(33)	
	f. Perifolliculosis		(26)			c. Absent knee jerk, bilateral		(34)	
	g. Purpura or petechiae		(27)			d. Absent ankle jerk, bilateral		(35)	
	h. Crackled skin (<i>mosaic</i>)		(28)			e. Absent vibratory sense, ankle		(36)	
	i. Loss of elasticity		(29)						
	j. Pellagrous dermatitis (<i>comments</i>)		(30)						
All Neg. <input type="checkbox"/>					All Neg. <input type="checkbox"/>				
10. ABDO- MEN Neg. <input type="checkbox"/>	a. Hepatomegaly		(31)		12. SCRO- TUM Neg. <input type="checkbox"/>	a. Scrotal dermatitis (8—Not applicable)		(37)	
13. Pulse (code direct)		(38-40)			14. Blood pressure (code direct) (mm Hg)		Systolic (41-43)		Diastolic (44-46)
D. Date of examination					E. Completion code				
(69-74)					0—Completed 1—Refusal 2—Not available				
Month Day Year					3—Informant incapable 4—Other				
					(75)				
F. Examiner's name					G. Card number 2				
(76-77)					(78-80)				
Code No.					0 5 2				
H. Comments									

(continued from p. 24)

Individuals found to have dental disease that is related to eating habits can then be counseled with regard to improvement in their dietary pattern. They can be referred for specific preventive measures—such as topical fluoride application or caries treatment, extractions, and/or other treatments when indicated. With proper data collection systems, the significance of dental findings in relation to diet will be elucidated in the future.

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Appendix B

Physical Signs and Nutritional Terms Associated with Malnutrition

1. General Appearance

Apathy: Unreactive, unresponsive, disinterested, and inattentive to surroundings.

Clinical Marasmus: Evidence of pronounced wasting of subcutaneous fat without edema. Significant apathy may be present. Frequently the face and eyes of the child may appear unusually bright due to the combination of wasting and prominence of the eyes. The child is usually considerably underdeveloped in relation to age and there may or may not be associated hair changes such as dyspigmentation, thinness, easily pluckable, or signs of avitaminosis.

Irritability: Hyperresponsive, excessive or overreaction to minor stimuli, particularly manifest through crying or unusual indication of fear as a result of minor or relatively insignificant happenings.

Kwashiorkor: Pitting edema at least on the pretibial region, underweight, undersize, underdeveloped for age. Muscular wasting may be present but masked by edema. Apathy of some degree is present. Changes in the hair are usually noted, such as thinning, easily pluckable with dyspigmentation or flag sign, and change in texture to silken, sparse hair. Dermatoses with desquamation of the so-called flaky-paint type, with or without hyperpigmentation. In severe cases the dermatosis may resemble a relatively severe burn but lacks erythema.

Pallor: Paleness and loss of color of skin, nail beds, mucosa and lips.

Prekwashiorkor: An underweight, undersized, underdeveloped child, without the evident pronounced wasting present in marasmus. Child is thin and undersized, but has relatively normal body proportions, has rather poor muscle tone, and hair changes may be present. Not apathetic, though would not be described as alert.

2. Hair

Dry staring: Dry wirelike, unkempt, stiff hair, often brittle, sometimes may exhibit some bleaching of the normal color.

Dyspigmentation: Definite change from normal pigment of the hair, most usually evident distally and best seen by carefully combing hair strands upward and viewing the orderly array of hair in good light. Dyspigmentation includes both change of pigment (usually lightening of color) and depigmentation. Not to be confused with dyed or tinted hair. Dyspigmentation is often bandlike in character and usually is associated with some change in texture of hair in the depigmented band. In some ethnic groups, particularly among Negroid, the pigment may be slightly reddish in color. In others, especially among straight black-haired peoples, the bandlike depigmentation ("flag sign") is common.

Easily pluckable: Easily pluckable hair is that in which the

shafts are readily removed with minimum tug when a few strands are grasped between the finger and thumb and gently pulled. In such cases there is a lack of reaction of the child, indicating a lack of pain associated with removing of the hair.

3. Skin

Crackled skin: Definite scales larger in size than those seen in xerosis. It is often congenital and is most prominent in cool weather. It is non-nutritional in origin.

Dependent edema: The presence of abnormally large amounts of fluid in the intercellular tissue spaces of the body; usually applied to demonstrable accumulation of excessive fluid in the subcutaneous tissues which are dependent upon position and gravity.

Dermatitis, with desquamation, or crazy-pavement type: Under this heading should be recorded those desquamating changes of the skin, usually with increased pigmentation, which occur on the extremities, especially legs, thighs and buttocks, but may occur over the trunk in association with kwashiorkor. (These have been termed "flaky-paint" dermatoses.) Small circumscribed bleblike lesions sometimes seen in association with kwashiorkor and which on occasion may precede the desquamation. In addition, any "crazy-pavement" type of lesions observed should be noted. These are characterized by a thin-appearing epithelium marked by striations usually resembling in outline the microscopic picture of epithelial cells. Not to be confused, however, with ichthyosis (scaly skin).

Follicular hyperkeratosis: This lesion has been likened to "gooseflesh" which is seen on chilling, but it is not generalized and does not disappear with brisk rubbing of the skin. Readily felt, as it presents a "nutmeg grater" feel. Follicular hyperkeratosis is more readily detected by the sense of touch than by the eye. The skin is rough, with papillae formed by keratotic plugs which project from the hair follicles. The surrounding skin is dry and lacks the usual amount of moisture or oiliness. Differentiation from adolescent folliculosis can usually be made through recognition of the normal skin between the follicles in the adolescent disorder. It is distinguished from perifolliculosis by the ring of capillary congestion which occurs about each follicle in scorbutic perifolliculosis.

Pellagrous dermatitis: Symmetrical lesions typical of acute or chronic, mild or severe pellagra are observed; lesions are usually red, often swollen or blistered like sunburn, pigmented, scaly over exposed areas; clearly demarcated from normal skin.

Purpura or petechia: Small localized extravasations of blood, red or purplish in color, depending on time elapsed since formation. Usually distributed at sites of pressure, and may be perifollicular.

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Xerosis: Xerosis is a clinical term used to describe a dry and crinkled skin which is accentuated by pushing the skin parallel to its surface. In more pronounced cases it is often mottled and pigmented, and may appear as scaly or alligator-like pseudo-plaques, usually not greater than 0.5 cm in diameter. Nutritional significance is not established. Differential diagnosis must be made from changes due to dirt and exposure and ichthyosis.

4. Skeletal

Bowleg: An outward curve of one or both legs at or below the knee (genu varum).

Costochondral beading: Palpable and visible enlargement of the costochondral junctions.

Cranial bossing: Abnormal prominence or protrusion of frontal of parietal areas.

Enlarged joints: When the more obvious ends of long bones are enlarged; i.e., the wrist, ankles, knees.

Winged scapula: A scapula having a prominent vertebral border.

5. Muscle

Muscle wasting: When appearance indicates abnormal loss of muscle substance, as exhibited by unusual prominence of bony skeleton, undue degree of folding of the skin of the buttocks, or the abnormal flabby feel (sometimes described as jelly-like) of the child with poor muscle tone.

6. Eyes

Bitot's spots: Bitot's spots are small circumscribed grayish or yellowish gray, dull, dry, foamy superficial lesions of the conjunctiva. They most often occur on the lateral aspect of the bulbar conjunctiva in the interpalpebral area. Do not confuse with pterygium.

Blepharitis: Inflammation of eyelids.

Keratomalacia: Softening of the cornea.

Thickened opaque bulbar conjunctivae: All degrees of thickening may occur. The blueness of the sclera may disappear and the bulbar conjunctivae develop a wrinkled appearance with increase in vascularity. The thickened conjunctivae may result in a glazed, porcelain-like appearance, obscuring the vascularity.

Xerosis conjunctivae: The conjunctivae, upon exposure by holding the lids open and having the subject rotate the eyes, appear dull, lusterless, and exhibit a striated or roughened surface.

7. Face

Angular lesions: Present bilaterally when mouth is held half open. May appear as pink or moist whitish macerated angular lesions which blur the mucocutaneous junction. Angular fissures are recorded when there is definite break in continuity of epithelium at the angles of the mouth.

Angular scars: Scars at the angles, which, if recent, may be pink; if old, may appear blanched.

Chellosis: Chellosis is when the lips are swollen, tense, or puffy, and where it appears, the buccal mucosa extends out onto the lips. These lesions are also denuded. This category may be used to record vertical fissuring of the lips, but not for lesions of the angles of the mouth only.

Nasolabial seborrhea: Definite greasy yellowish scaling or filiform excrescences in the nasolabial area which become more pronounced on slight scratching with the fingernail or a tongue blade.

8. Mouth

Filiform papillary atrophy: Filiform papillae exceedingly low or absent, giving the tongue a smooth appearance which remains after scraping slightly with an applicator stick. "Mild" involves less than $\frac{1}{4}$ of the tongue (tip and lateral margins only); "moderate" involves $\frac{1}{4}$ to $\frac{3}{4}$ of the tongue; "severe" involves over $\frac{3}{4}$.

Glossitis: Glossitis is any increase in redness, fissuring or swelling with color change (break in lingual mucosa) or diffuse involvement of mucosa. Geographic tongue has the typical irregularly shaped and distributed areas of atrophy with irregular white patches resembling leukoplakia. Glossitis is usually associated with some sensation of pain or burning, particularly upon eating.

Magenta colored: The color of alkaline phenolphthalein.

Swollen gums: Swollen red interdental papillae, with more than one papilla involved.

9. Teeth

Carious teeth: Molecular decay of a bone in which it becomes friable, thinned, and dark, and gradually breaks down with the formation of pus.

Fluorosis: Opaque paper-white areas in the enamel of the tooth, ranging in size from a few flecks to entire enamel surface. In the latter case brown stain is a frequent accompaniment as is attrition of opposing surfaces. The most severe forms of fluorosis include discrete or confluent pitting, with widespread brown staining and a general, corroded appearance.

10. Glands

Parotid enlargement: Because of various types of facial configuration, parotid enlargement may be easily missed in certain populations. Check by palpation, moving the gland with fingers upward and backward toward the ear. Check if bilateral.

Thyroid enlargement: Thyroid enlargement is when a visually perceptible enlargement definitely palpable with or without swallowing is noted. It is preferable to examine the subject with his head slightly extended in order to detect thyroid enlargement.

11. Organs

Hepatomegaly: Liver edges more than 2 cm below the costal margin. (In children, the liver edge may be normal palpable.)

Splenomegaly: Spleen is palpable.